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Intrinsic current driven by electromagnetic electron temperature gradient turbulence in tokamak plasmas

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The mean parallel current density evolution equation is presented using the electromagnetic (EM) gyrokinetic equation. The ratio of intrinsic current density driven by EM electron temperature gradient turbulence to the background bootstrap current density is estimated. The intrinsic current density driven by the residual turbulent source is negligible as compared to that driven by the residual turbulent flux. The local intrinsic current density driven by the residual turbulent flux for mesoscale variation of turbulent flux can reach about 80% of the bootstrap current density in the core region of an ITER standard scenario, but there is no net intrinsic current on a global scale.